

R E M A R K S

Pages 25 and 26 of the specification were amended to replace the description of Fig. 24 with that of Fig. 25, and to replace the description of Fig. 25 with that of Fig. 24.

Claim 24 was amended to include the features of (i) a gas oxidation degree, which was previously recited in claim 48 and which is supported at the bottom of page 61 of the specification; and (ii) a heat load of the furnace wall, which is supported by page 63, lines 8 to 23 of the specification.

The post combustion rate recited in amended claim 48 is supported by Tables 3 and 4 on pages 68 and 69, respectively, of the specification.

New claim 49 recites a feature which was previously recited in claim 48.

A feature of the presently claimed invention is to control a heat load of the furnace wall by using a relationship among a de-volatilizing degree of the carbonaceous material, a post combustion rate in the smelting reduction furnace and the heat load of the furnace wall.

None of the cited references teach or suggest the relationship among the de-volatilizing degree of the carbonaceous

material, the post combustion rate in the smelting reduction furnace and the heat load of the furnace wall.

According to the present invention, the post combustion rate can be increased without inviting so much heat loss, and it is possible to lower the net unit of coal, the net unit of oxygen and the cost of equipment. The above-mentioned advantageous results would not be expected from the disclosures of the cited references.

Claims 24 to 26, 38, 41 and 43 to 48 were rejected under 35 USC 103 as being unpatentable over Satchell, Jr. (USP 5,938,815) for the reasons set forth on pages 2 to 4 of the November 25, 2003 Office Action.

It was admitted in the November 25, 2003 Office Action that Satchell, Jr. (USP 5,938,815) does not explicitly disclose the following:

- (i) that the high-purity oxygen feed 14 may be a gas containing 20% or more of oxygen; and
- (ii) devolatilizing the carbonaceous material until a volatile content of less than 10% is achieved.

Satchell, Jr. (USP 5,938,815) discloses that an iron ore feed, a carbon containing substance, and an oxygen containing gas

are fed in a secondary reactor to produce products. The secondary reactor is a fluidized bed reactor, an internal circulating fluidized bed reactor, an internal circulating fluidized bed reactor, or a circulating flow reactor, as recited in claim 7 of Satchell, Jr. (USP 5,938,815).

In the presently claimed invention, a carbonaceous material and an ore are charged into a reacting furnace for directly contacting the carbonaceous material and oxide or hydroxide ores. The atmosphere around the ore is affected by the influence of the carbonaceous material. The ore is reduced until at least a part of the ore is metallized, and the carbonaceous material is devolatilized until a volatile content of the carbonaceous material is less than 10%. The reduction and de-volatilization are carried out under the condition of the carbonaceous material and the ore are in contact with each other. In contrast to the present invention, Satchell, Jr. (USP 5,938,815) employs a fluidized bed reactor in which the carbonaceous material and the ore are not in contact with each other. The atmosphere around the ore in Satchell, Jr. (USP 5,938,815) is not affected by the carbonaceous material.

Therefore, it is respectfully submitted that the presently claimed invention is substantially different from Satchell, Jr. (USP 5,938,815) regarding the pre-reduction furnace and the pre-reduction method.

Claims 27 and 39 were rejected under 35 USC as being unpatentable over Satchell, Jr. (USP 5,938,815) and further in view of JP 6-271919 for the reasons set forth in the paragraph bridging pages 3 and 4 of the November 25, 2003 Office Action.

Satchell, Jr. (USP 5,938,815) was discussed above.

It was admitted in the November 25, 2003 Office Action that Satchel, Jr. does not disclose a rotary kiln as a secondary reactor for reducing iron ore.

JP 6-271919 discloses a method for pre-treating coal and ore in a smelting reduction furnace, the method consisting of a first process for preheating the powdery ore at 500-900 °C and a second process for heating in horizontal furnace up to 900 °C by adding the coal to the preheated ore.

The present invention employs a single reacting furnace. A carbonaceous material and an ore are charged into the reacting furnace. Step (b) in applicants' claim 24 of reducing the ore

and de-volatilizing the carbonaceous material comprises reducing the ore and de-volatilizing the carbonaceous material at a temperature of at least 950°C in the reacting furnace. The reduction temperature of the presently claimed invention is substantially different from that of JP 6-271919.

Claims 27 and 40 were rejected under 35 USC 103 as being unpatentable over Satchell, Jr. (USP 5,938,815) and further in view of Kundrat (USP 5,567,224) for the reasons set forth at the middle of page 4 of the November 25, 2003 Office Action.

It was admitted in the November 25, 2003 Office Action that Satchell, Jr. (USP 5,938,815) does not disclose a rotary hearth furnace as a secondary reactor.

It is respectfully submitted that the above discussion of Satchell, Jr. (USP 5,938,815) demonstrates that the presently claimed invention is patentable over Satchell, Jr. (USP 5,938,815) alone, or combined with any of the cited references, such as Kundrat (USP 5,567,224).

Claims 24 to 27, 38 to 41 and 43 to 48 were rejected under 35 USC 103 as being unpatentable over Meissner et al. (USP 5,730,775) in view of Kaneko et al. (USP 4,701,214) and Sarma et

al. (USP 6,171,364) for the reasons set forth in the paragraph bridging pages 4 and 5 of the November 25, 2003 Office Action.

It was admitted in the November 25, 2003 Office Action that Meissner et al. (USP 5,730,775) do not explicitly disclose a step of de-volatilizing a carbonaceous material until a de-volatilized carbonaceous material having a volatile content of less than 10% is obtained.

It was also admitted in the November 25, 2003 Office Action that Meissner et al. (USP 5,730,775) do not explicitly discuss a step of controlling a post combustion rate within a smelting reduction furnace.

According to Kaneko et al. (USP 4,701,214), a finely divided carbonaceous material is introduced into a vessel beneath the surface of a bath in a smelting reduction furnace. Kaneko et al. (USP 4,701,214) do not teach charging de-volatilized carbonaceous material into a smelting reduction furnace having a metal bath.

It is respectfully submitted that one of ordinary skill in the art would not consider combining the references. However, even assuming *arguendo* that the references are combinable, if Meissner et al. (USP 5,730,775) is combined with Kaneko et al. (USP 4,701,214) and Sarma et al. (USP 6,171,364), such combination would teach to charge a de-volatilized carbonaceous

material into a smelting furnace having a metal bath.

It is therefore respectfully submitted that applicants' claimed invention is not rendered obvious over the references, either singly or combined in the manner relied upon in the Office Action in view of the distinctions discussed hereinabove. It is furthermore submitted that there are no teachings in the references to combine them in the manner relied upon in the Office Action.

Reconsideration is requested. Allowance is solicited.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

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Respectfully submitted,



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Enc.: (1) PETITION FOR EXTENSION OF TIME

(2) 24 Replacement Drawing Sheets for  
Figs. 1A, 1B, 2A, 2B and 3 to 26, including  
5 annotated sheets showing changes